

Studies in Traumatic Amnesia

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THERE ARE BASICALLY two kinds of amnesia. One is due to destruction of retentive patterns of memory for a category of things, as occurs in alexia, due to destruction of the major angular gyrus. In this condition the engram patterns representing the memory are destroyed so there is nothing to recall; the patient cannot even read, and he must learn all over by building new patterns in the other angular gyrus. The other basic type is amnesia of recall, in which the basic patterns are not destroyed but contact with them is lost.

In cerebral concussion, without contusion or laceration, the memory loss is of the second variety. The engram patterns are not destroyed but the patient finds it difficult to find the past events in his memory patterns. He loses memory for a period of time. In contusion or laceration there may be absolute loss of a category of memories (as in the first type) if the lesion occurs in a specific area of cortex. Thus *temporal amnesia* occurs in concussion, in senile dementia and in the fugue states of epilepsy, and *categorical amnesia* in agnosia and in hysteria. Following cerebral concussion there may be amnesia for a period of time before the injury—*retrograde amnesia*. There may also be amnesia for events subsequent to awakening from coma—*anterograde amnesia*—but the latter period is complicated by difficulty in making observations; interest and attention may be difficult or lacking due to the general mental state resulting from the blow.

Retrograde amnesia following cerebral concussion and, of course, following more severe cerebral damage, is routine. After simple concussion with unconsciousness for a fraction of a minute, the amnesia is usually for about half a minute to a minute before the blow. It is common for a man struck while crossing a street to have no recollection of leaving the curb. Often he will say something such as: "I saw a lot of cars coming. The last I remember is standing on the curb deciding to cross."

How does retrograde amnesia come about? It is not difficult to conceive of new memory patterns being disrupted when they have not had time to establish associations. It is, however, difficult to understand how a man can have retrograde amnesia of a whole day or of a week as the result of a blow

• *Retrograde amnesia is for a period of time, usually for a fraction of a minute in simple concussion, and not loss of memory for an event. The length of time for which there is no recollection is not directly related to the duration of coma but can be for days or even weeks.*

It is characterized by inability of restoration of memory for the period in question. Any retrograde amnesia of more than a day's duration results from trauma only if the trauma is severe enough to cause prolonged coma, usually weeks. It should be under suspicion of being due pathologically to more than concussion. Careful attention should be given to the possibility of hysteria or malingering as a factor.

on the head. It would seem, *a priori*, that such memories have had time to be ingrained and should still be present, although perhaps hard to recall.

Everything one sees, everything one perceives, ordinarily leaves a memory pattern, an engram, which is the anatomical and physiological basis of retentive memory as distinguished from memory of recall. That basic engram will remain for life unless it is anatomically destroyed. And unless it actually is destroyed as by hemorrhage, softening or neoplasm, the memory pattern is there to be recalled, if not voluntarily, at least by hypnosis or by some other technique.

Memory of events occurring during the period for which a patient has retrograde amnesia following a blow to the head is difficult, if not impossible, to restore. It is acknowledged that the memory patterns have not been destroyed by hemorrhage, thrombosis or embolism when no abnormality is noted upon neurological examination, but associations have been broken. The amnesia that is caused by simple concussion, therefore, is amnesia of recall and not gross destruction of memory patterns.

In general, the longer the period of traumatic coma the longer the period of retrograde amnesia. Yet the period of retrograde amnesia does not vary directly with the period of coma; it is usually much shorter than the coma. In simple concussion, retrograde amnesia for a period of more than five minutes is unusual. Ordinarily, retrograde amnesia of an hour would be associated with coma of a full day, and retrograde amnesia of more than a week would be related to several months of coma.

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If long periods of retrograde amnesia—a day or more—are claimed, hysteria or malingering should be suspected; careful study should be made of the possibility of serious complication of the trauma, such as hemorrhage into the brain stem.

Reports of three illustrative cases follow:

CASE 1: A man aged 40 years was involved in an automobile accident and was unconscious five weeks in spite of good care, with tracheotomy and even exploration for subdural hemorrhage, which was not present. After regaining consciousness he was disoriented for two weeks. He then had aphasia and right homonymous hemianopia. The patient recovered from aphasia but not from hemianopia. Upon examination 11 months after the accident it was noted that the right pupil did not react to light and the left pupil reacted sluggishly. The remaining cranial nerves were normal. Thus there must have been a vascular lesion in the mesencephalon secondary to the trauma. The sixth thoracic vertebra and one wrist had been fractured. Babinski's sign was evoked on both sides.

The patient had retrograde amnesia of 20 hours. Even when his activity of the previous day was related to him he could not recall even setting out on a trip the day before the accident. His memory was poor in general, especially for dates and names, and he could not think as well as formerly. Still his recall of his past life until the day before the accident was good. Retrograde amnesia of about 20 hours was therefore accepted as a fact.

CASE 2: A man 43 years of age was unconscious for three weeks after injury in a collision.

Fourteen months after the injury he still had retrograde amnesia of three months. He could not recall having moved into a new house or having done anything else in that period. He said that memory for his entire life was hazy and his wife was constantly filling in gaps for him. Alteration of personality was noted in him. He was completely apathetic about his family, home and work. He said he just did not feel like working and he spent his time sitting about the house or at the beach. He still had assumed no responsibility for the expenses of living or even in helping his wife about the house.

The blood pressure, pulse rate, all reflexes of the body and the cranial nerves, including those serving the fundi and pupils, were completely normal. There were no complaints of dizziness or headache.

With a mental state of complete apathy, it is admittedly difficult to determine any loss of memory for the remote past. The patient would make no effort to recall and he answered vaguely all questions about current events. However, there was no question about retrograde amnesia of three months.

CASE 3: A man 33 years of age when observed was still disabled two years after injury in an automobile accident. The records in the case showed coma for four months after the injury, but the patient said he had been comatose for five months. He also claimed anterograde amnesia of seven months in addition to retrograde amnesia of

twelve years. Because of these claims, a personality study was made. It was found that he had left school at the age of 14 years to work on a farm. At the age of 17, he began to work at copper mining and supported his mother and two younger siblings because his father, a chronic alcoholic, had left home. After 18 months of mining he became an apprentice painter and learned the trade. He moved about a great deal. Born in Arkansas, he lived in several cities until he moved to Arizona for a sojourn of several years in a number of different cities, then moved back to Arkansas. There he married. When he entered the armed forces he left his wife and child in Arkansas. It soon developed that he related happenings within the 12-year period for which he claimed amnesia. When this was pointed out to him, he said that when he heard part of a story he could recall the rest. He was separated from the service.

He left his wife and obtained a divorce on grounds of adultery in Arkansas in 1945, and then came to California. He married again in 1947. When he attempted to reenlist he was refused because his wife had tuberculosis. He obtained a divorce. When he was again separated from the service, he tried to remarry his second wife but she refused. He continued to fill in details of the 12-year period because it was after these events that his accident occurred. From this it was concluded that he forgot whatever it was convenient to forget and that the amnesia should not be called retrograde. Neither was it hysterical, for he readily accepted all facts given him and was completely unemotional about them. His pragmatic approach to reality is also shown by his divorcing his first wife and forgetting about her, his divorcing his second wife to enable him to enlist, and his return to her later. As he believed that a long period of amnesia would give him greater compensation than a short one, there was an element of malingering in the case.

Since the degree of retrograde amnesia is fairly proportional to the duration of coma following a blow to the head, and since retrograde amnesia may actually cover many days after weeks of coma, it must be assumed that, other things being equal, the newest memories with the fewest associations are more vulnerable than old ones. It is easily understood that memories with strong emotional value are more resistant to destruction than others. Retrograde amnesia, due simply to concussion, is therefore much like the amnesia of senile dementia or of senility in being purely temporal in character. Amnesia due to traumatic hemorrhage is like that of thrombosis, embolism or cerebral compression on a focal spot—it is categorical; a category of memories is lost. Hysterical amnesia is both temporal and categorical. The amnesias of agnosia and aphasia are purely categorical. Temporal amnesia is due to interference with association patterns and hence is amnesia of recall. The memory patterns are still present and need only to be evoked.

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